



## Supporting Evidence-Based Practices and Standardization of Care through Implementation of Outpatient, Emergency Department, and Hospital COVID-19 Order Sets in a Large Healthcare System

**Timothy P. Gauthier, Pharm.D., BCPS**  
 Manager of Antimicrobial Stewardship  
 Clinical Program  
 Baptist Health South Florida

**Erika Gonzalez, MSN, RN, CCRN, NE-BC**  
 AVP of Evidence Based Clinical Care  
 Baptist Clinical Enterprise

In March 2020 the coronavirus (SARS-CoV-2) pandemic which causes COVID-19 disease was making its way across the globe and had begun to spread in the United States. In preparation for the impending public health crisis, the Baptist Health South Florida Antimicrobial Stewardship Program (BHSF ASP) personnel reflected upon the Center for Disease Control and Prevention's (CDC) Core ASP Principles and took note of emerging literature related to the role of antimicrobial stewardship in COVID-19 preparation and response (Centers for Disease Control and Prevention, 2019; Sanchez et al., 2016; Stevens et al., 2020). This led to the development of a multi-faceted ASP COVID-19 strategy including consideration for drug shortages, diagnostic stewardship, guideline creation, emerging investigational therapeutics, education, and monitoring of local practices.

During this time, a role for outpatient, emergency department (ED), and hospital COVID-19 order sets was identified, which we aim to describe here. Order sets are electronic forms which can be tailored to the needs of a patient with a specific diagnosis and enable clinicians to select orders from a pre-populated list. To develop and implement COVID-19 order sets, an interdisciplinary approach was taken including the key element of connecting with the BHSF Evidence Based Clinical Care (EBCC) leadership. The BHSF EBCC provides structure and guidance to the organization in the design, adoption and implementation of relevant and up-to-date synthesized research based clinical pathways and protocols that can be measured in real time across the entire patient episode of care; in

order to eliminate clinical variation, improve patient safety, and reduce costs.

Following a rigorous development process that included input from operational leadership, clinical specialists, nursing, informatics, and others, the BHSF COVID-19 outpatient (Figure 1), ED (Figure 2), and hospital COVID-19 order sets went live in mid-March of 2020. This was approximately the same time at which initial businesses began closing and educational facilities closed in state of Florida. The order sets included sections such as general guidance, lab, radiology, nursing, respiratory, intravenous fluids, supportive medications, and consults. Commentary was included within the order set to provide guidance to clinicians on strategies recommended by CDC on the appropriate care of patients with COVID-19. For example, in the intravenous fluids section the statement "consider limiting use of IVF (which can exacerbate acute respiratory distress syndrome) unless otherwise indicated" was included. As the pandemic has progressed and additional literature and best practices have emerged, the order sets have been updated. As with the development and implementation of the order sets, changes have been reviewed then facilitated by a multidisciplinary group.

Data indicate the COVID-19 order sets have served as a useful tool for BHSF providers. From March 18<sup>th</sup> through July 15<sup>th</sup> of 2020 the COVID-19 Power Plans were used 8,556 times (3,464 in outpatient setting, 2,106 in the emergency department setting, and 2,986 in the inpatient hospital setting). Urgent care providers have utilized the

**PHARMACY INITIATIVE****COVID-19 Special Edition****Figure 1.****COVID-19 Urgent Care Power Plan**

UC COVID-19 Adults-B (Initiated Pending)		
Patient Care		
<p>Not all patients, especially those with mild disease, require hospitalization. Clinical judgment should be used in deciding which patients can be safely discharged home vs. admitted to the hospital. Some factors that are associated with more severe disease include hypoxemia, older age, elevated SOFA score, D-dimer greater than 1, lymphopenia, elevated ESR, and underlying cardiovascular disease. Patients with mild symptoms not admitted to the hospital but suspected or confirmed with COVID-19 should be instructed to seek medical assistance or go to the hospital if their condition worsens.</p> <p>Risk factors for progression include:</p> <ul style="list-style-type: none"> <li>Older age</li> <li>Underlying medical conditions (e.g., lung disease, cancer, heart failure, cerebrovascular disease, renal or liver disease, diabetes, immunocompromising conditions, pregnancy)</li> </ul> <p>Patients should be counseled about appropriate quarantine and infection prevention procedures</p> <p>Some medications prescribed for managing COVID-19 such as chloroquine and hydroxychloroquine can cause QT prolongation</p>		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Patient Isolation/Precautions
		Droplet/Contact COVID19, Use PPE as recommended in BHSF protocols
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pulse Oximetry Continuous
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Saline lock with routine flush
Medications		
Respiratory Treatments		
<p>Nebulizer treatments can potentially aerosolize the virus and increase the chances for exposing others.</p>		
Supportive Care Medication		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	acetaminophen (Tylenol)
		650 mg, Oral, Tab, Once
		Use with caution in liver dysfunction, do not exceed 3000 mg per day.
Corticosteroids		
<p>Patients with MERS-CoV or influenza who were given corticosteroids were more likely to have prolonged viral replication, receive mechanical ventilation, and have higher mortality. The CDC recommends to avoid corticosteroids for COVID-19 severe disease unless indicated for other reasons (e.g., chronic obstructive pulmonary disease exacerbation or septic shock).</p>		
Laboratory		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	CBC with Diff-UC
		Blood, Stat, T;N
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Basic Metabolic Panel w/ Ionized Calcium UC
		Blood, Stat, T;N
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pregnancy Test-Urine (Qual)
		Urine, collect Stat, T;N
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Influenza A&B Antigen Screen
		collect Stat, T;N
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Coronavirus (SARS-CoV-2) Quest
Diagnostic Tests		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Chest 2 Views XR
		Stat
Card/Vasc/Neuro		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	EKG Standard
		Stat
Respiratory		
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Oxygen Therapy
		SpO2 goal 92% or greater, Titrate FIO2, keep SaO2 greater than 92%

outpatient power plan the most, emergency medicine providers have used the ED power plan most frequently, and hospitalists have used the hospital power plan the greatest number of times.

Through engaging a multidisciplinary group we have been able to standardized and evolve evidence-based practices that are widely utilized within our healthcare system during a pandemic event. We believe this has been an important endeavor to support our clinicians as they provide the highest standard of care for patients during these unprecedented times. Through this work we have also strengthened our relationships within the organization, working as a team and combining our knowledge to develop high quality products. We take great pride in the work happening at BHSF and while there will surely be new challenges ahead, we are confident that together we can overcome any obstacle and meet the healthcare needs of our community.

**ACKNOWLEDGMENTS**

Susan Sarram, Kristina Lee, Yenny Ceballos, Seema Chandra, Rebecca Cespedes, Michael

Pasqualicchio, Lellany Ruiz, Henry Triana, Lucas Lax

**DECLARATION OF INTEREST**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

**AUTHORS**

**Erika Gonzalez, MSN, RN, CCRN NE-BC,** AVP of Evidence Based Clinical Care, Baptist Clinical Enterprise, Baptist Health South Florida, Miami, FL, US. Correspondence regarding this paper can be directed at: [ErikaG@baptisthealth.net](mailto:ErikaG@baptisthealth.net)

**Timothy P. Gauthier, PharmD, BCPS,** Manager, Antimicrobial Stewardship Clinical Program, Baptist Health South Florida, Miami, FL, US. Correspondence regarding this paper can be directed at: [TimothyGa@baptisthealth.net](mailto:TimothyGa@baptisthealth.net)

## PHARMACY INITIATIVE

### COVID-19 Special Edition

Figure 2.

#### COVID-19 Emergency Department Power Plan

ED COVID-19 Adults-B (Initiated Pending)	
Patient Care	
<p>Not all patients, especially those with mild disease, require hospitalization. Clinical judgment should be used in deciding which patients can be safely discharged home vs. admitted to the hospital. Some factors that are associated with more severe disease include hypoxemia, older age, elevated SOFA score, D-dimer greater than 1, lymphopenia, elevated ESR, and underlying cardiovascular disease. Patients with mild symptoms not admitted to the hospital but suspected or confirmed with COVID-19 should be instructed to seek medical assistance or go to the hospital if their condition worsens. Risk factors for progression include:</p> <ul style="list-style-type: none"> <li>Older age</li> <li>Underlying medical conditions (e.g., lung disease, cancer, heart failure, cerebrovascular disease, renal or liver disease, diabetes, immunocompromising conditions, pregnancy)</li> </ul> <p>Patients should be counseled about appropriate quarantine and infection prevention procedures</p> <p>Some medications prescribed for managing COVID-19 such as chloroquine and hydroxychloroquine can cause QT prolongation.</p>	
<input type="checkbox"/>	<input checked="" type="checkbox"/> Pulse Oximetry Continuous
<input type="checkbox"/>	<input checked="" type="checkbox"/> ED Cardiopulmonary Monitoring
<input type="checkbox"/>	<input checked="" type="checkbox"/> Vital Signs <span style="float: right;">per protocol</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> POCT Glucose-Monitor
<input type="checkbox"/>	<input checked="" type="checkbox"/> Saline lock with routine flush
Diet/Nutrition	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> NPO
Medications	
IV Therapy	
<p>Consider limiting use of IVF (which can exacerbate ARDS) unless otherwise indicated.</p>	
<input type="checkbox"/>	<input checked="" type="checkbox"/> sodium chloride (sodium chloride 0.9% flush) <span style="float: right;">5 mL, Flush, Injectable, As Directed, other (see comment) Saline lock with routine flush.</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Sodium Chloride 0.9% solution <span style="float: right;">IV Continuous, 1,000 mL Order Rate: 50 mL/hr</span>
Respiratory Treatments	
<p>Nebulizer treatments can potentially aerosolize the virus and increase the chances for exposing others.</p>	
Supportive Care Medication	
<input type="checkbox"/>	<input checked="" type="checkbox"/> guaifenesin-dextromethorphan (guaifenesin-dextro... <span style="float: right;">5 mL, Oral, Solution, Once</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> acetaminophen (Tylenol) <span style="float: right;">650 mg, Oral, Tab, Once Use with caution in liver dysfunction, do not exceed 3000 mg per day.</span>
Corticosteroids	
<p>Patients with MERS-CoV or influenza who were given corticosteroids were more likely to have prolonged viral replication, receive mechanical ventilation, and have higher mortality. The CDC recommends to avoid corticosteroids for COVID-19 severe disease unless indicated for other reasons (e.g., chronic obstructive pulmonary disease exacerbation or septic shock).</p>	
Antiviral Agents	
<p>There is no preferred antiviral treatment for COVID-19. Early supportive care is the mainstay of treatment. Co-infection with influenza and COVID-19 is possible but unlikely. Only if flu coverage is indicated:</p>	
<input type="checkbox"/>	<input checked="" type="checkbox"/> oseltamivir (Tamiflu) <span style="float: right;">for CrCl &gt; 60 mL/min, 75 mg, Oral, Cap, Once, Viral Treatment</span>
Laboratory	
<input type="checkbox"/>	<input checked="" type="checkbox"/> CBC with Diff (BHSF) (CBC with Diff) <span style="float: right;">Blood, Stat, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Basic Metabolic Panel - BMP <span style="float: right;">Blood, Stat, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Albumin Blood <span style="float: right;">Blood, Stat, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> CRP (C-Reactive Protein) <span style="float: right;">Blood, Stat, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> SED Rate <span style="float: right;">Blood, ST, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> D-Dimer (Quant) <span style="float: right;">Blood, ST, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Lactic Acid with Reflex <span style="float: right;">Blood, ST, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Pregnancy Test-Urine (Qual) <span style="float: right;">Urine, collect Stat, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Coronavirus (SARS-CoV-2) Quest
<input type="checkbox"/>	<input checked="" type="checkbox"/> Influenza A&B Antigen Screen <span style="float: right;">collect Stat, T;N</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Procalcitonin - PCT <span style="float: right;">Blood, ST, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Hepatic Function Panel <span style="float: right;">Blood, Stat, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> PT-INR (Prothrombin Time) (PT (with INR)) <span style="float: right;">Blood, ST, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> PTT (Partial Thromb Time) <span style="float: right;">Blood, ST, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Ferritin Level <span style="float: right;">Blood, Stat, T;N, Draw Rainbow Set (Pink (Blood Bank), Blue, Gold, Green, Lavender, Gray (Lactate))</span>
Diagnostic Tests	
<input type="checkbox"/>	<input checked="" type="checkbox"/> Chest Single View XR <span style="float: right;">Stat</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Chest 2 Views XR <span style="float: right;">Stat</span>
<input type="checkbox"/>	<input checked="" type="checkbox"/> Chest CT WO Con <span style="float: right;">Stat</span>
Card/Vasc/Neuro	
<input type="checkbox"/>	<input checked="" type="checkbox"/> EKG Standard <span style="float: right;">Stat</span>
Respiratory	
<p>High flow oxygen nebulizer treatments and non-invasive positive pressure ventilation (CPAP/BiPAP) are highly discouraged in patients with suspected or confirmed COVID-19 as they create aerosolized particles.</p>	
<input type="checkbox"/>	<input checked="" type="checkbox"/> ABG With CO-OX
<input type="checkbox"/>	<input checked="" type="checkbox"/> Oxygen Therapy <span style="float: right;">Nasal Cannula, Flow Rate (L/min): 1-5, SpO2 goal 94% or greater, titrate for SaO2 above 94% as per policy</span>

## REFERENCES

Centers for Disease Control and Prevention. (2019). *Core Elements of Hospital Antibiotic Stewardship Programs*. <https://doi.org/10.1093/cid/ciu542>

Sanchez, G. V., Fleming-Dutra, K.E., Roberts, R.M., Hicks, L.A. (2016). *Core Elements of Outpatient Antibiotic Stewardship*. *MMWR*. [doi.org/10.15585/mmwr.rr6506a1](https://doi.org/10.15585/mmwr.rr6506a1)

Stevens, M. P. , Patel, P. K. & Nori, P. (2020). Involving antimicrobial stewardship programs in COVID-19 response efforts. *Infection Control & Hospital Epidemiology*, 41(6), 744–745. [doi:10.1017/ice.2020.69](https://doi.org/10.1017/ice.2020.69)